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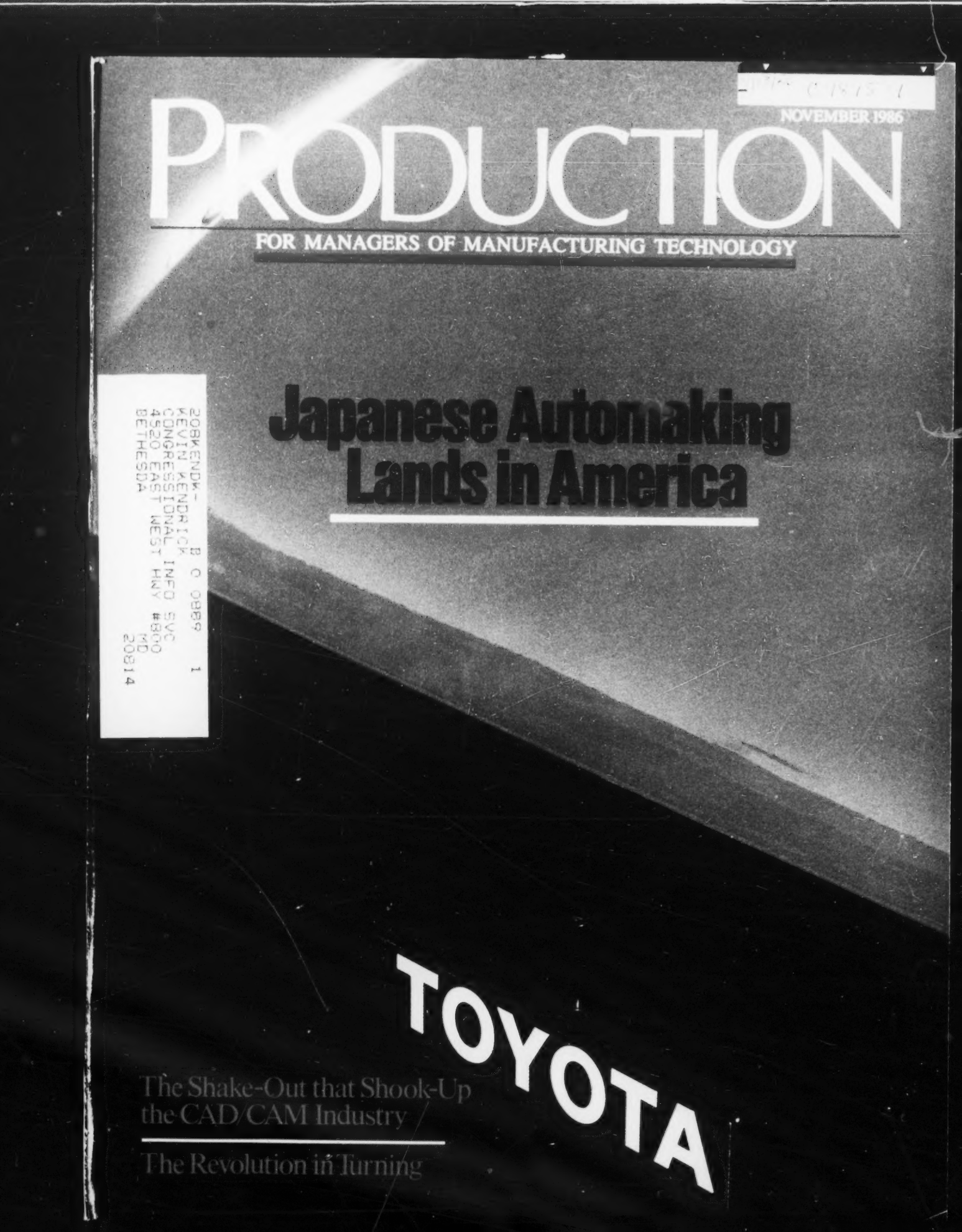
Japanese Automaking Lands in America



The Shake-Out that Shook-Up the CAD/CAM Industry

The Revolution in Turning

PRODUCTION

NOVEMBER 1986 VOL. 98 NO. 5

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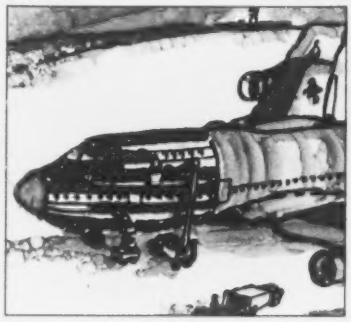

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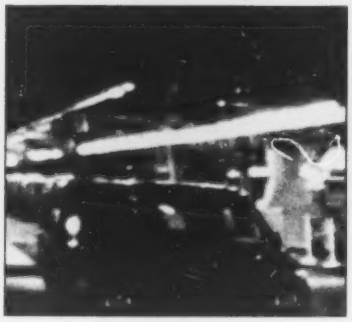

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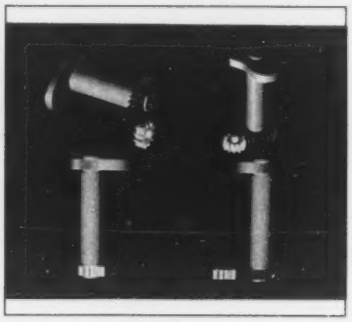

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JAPANESE AUTOMAKING LANDS IN AMERICA

42 *American auto manufacturers are scurrying to match the high technology manufacturing operations, the productivity gains, and the quality assurance that have been the hallmarks of Japanese car plants that have been "transplanted" in the U.S.*

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Cover photo by Robert Penneys. Truck courtesy of Central City Toyota, Phila. PA.

U.S. Automakers See World-Class Quality by 1990

QUESTION: **FOR EACH OF THE FOLLOWING PERFORMANCE MEASURES, INDICATE YOUR ASSESSMENT OF WORLD CLASS PERFORMANCE, AS WELL AS YOUR COMPANY'S CURRENT PERFORMANCE.**

	VEHICLE MANUFACTURERS	
WORLD CLASS PERFORMANCE MEASURES	WORLD CLASS PERFORMANCE	CURRENT PERFORMANCE
Percent of processes which are statistically capable of first-time quality production at designed rate	90%	50%
Total lead-time from engineering concept through start of production for new products	36 mo.	60 mo.
Percent of products which meet cost objectives after first year of production	80%	50%
New equipment uptime during first year of production	90%	60%
Total production lead-time from first operation through "Ready to Ship"	2 days	3 days
Average days to process an engineering change from request through production implementation	30 days	100 days
Average number of engineering changes generated internally for a product in first year of production	80	600
Annual research and development cost as a percent of sales	5%	3%
Raw material yield in first year of production	80%	60%
Fixed asset turnover, which is defined as annual cost of sales divided by fixed assets employed (plant and equipment only)	4	3
Sales per square foot of plant (including both productive and storage areas for raw materials, WIP and finished)	$1,000	$1,120
Average number of levels in the manufacturing bill-of-material for a plant's products	3	5

A substantial need for manufacturing improvement exists if U.S. auto building is to become "world class." That conclusion can be drawn from a mini-Delphi Survey conducted by the Detroit office of Arthur Andersen & Co.

Respondents to the survey included 14 vehicle manufacturers, 76 automotive parts suppliers and 28 other related manufacturing companies. Most respondents percieve a significant gap between their current performance and world-class performance needed to be competitive in the world marketplace.

Most of the respondents also said that they could accomplish the improvements by 1990. The table ranks, in order of importance, the problems and also indicates a measure of the magnitude of improvement needed. The consensus of the survey indicated, for example, that a world-class vehicle manufacturer would get new processes and equipment up and producing specified quality and output 90 pct of the time. Today's average is 50 pct. Similarly, a world-class manufacturer could go from engineering concept to product production in 36 months. It now takes 60 months.

The fact that many respondents cited 1990 as the time when they will have closed the gap is, to one observer, "At the very least, optimistic."

GM, Japanese Firms Form Joint Ventures

When General Motors positions itself to face the competition, the results are frequently—unique, with the latest such strategy resulting in joint venture agreements with three Japanese firms: Suzuki Motor Company, Akebono Brake Industry Company and NHK Spring Company.

The Suzuki venture with General Motors of Canada includes the building of a new 1.6 million-sq.-ft. facility in Ingersoll, Ontario that will have an annual production capacity of 200,000 cars and light utility vehicles. Next generation Chevrolet Sprint, Pontiac Firefly (sold only in Canada), the Suzuki Forsa and a utility vehicle similar to the Suzuki Samaurai 4WD unit will be produced there when the plant starts up in 1989.

In the United States, General Motors and Akebono Brake Industry Co. have selected Elizabethtown, Ky., as the plant site for this joint venture. To be known as American Brake Industry Corp., the 50/50 venture is expected to produce 1 million brake shoes and 30,000 disc brakes monthly when production begins in early 1988.

In Japan, the Inland Division of General Motors and NHK Spring Company are joining expertise in FRP spring R&D by forming the NHK Inland Corporation.

The new venture, which will be majority controlled by its Japanese parent, will make use of an existing NHK Spring Co. facility near Tokyo to produce the FRP units.

Robot Shipments Down 13 Percent

U.S. manufacturers shipped nearly 5,800 robots in 1985, down 13 pct from the approximately 6,500 in 1984, according to the Census Bureau.

The robots shipped were valued at $317 million. Robot accessories, subassemblies, and components and parts shipments totaled another $70 million, up from $56 million in 1984.

The largest category of robots shipped in 1985, accounting for 19 pct, were those used for welding, soldering, brazing, and/or cutting. They were valued at $97 million. Next were robots used to spray, paint, glue and/or seal, valued at $83.4 million.

The report gives information on the anticipated end-use or function of robots as well as data on robot accessories, sub-assemblies, and components and parts. It contains substantial revisions to data released in the 1984 report, which was the first year this information was collected. Revisions were caused by late reporting, corrections to exclude some imported robots, and corrections to exclude some reporting of the total value of systems that include robots rather than just the value of the robots themselves.

Technical Ceramics Market Projections—1985-94
North American (Million 1984 Dollars)

EXISTING APPLICATIONS

	1985	1994	1985-1994 Average Annual Real Growth	Leading Products	Leading Materials
Electronics	$1,375	$2,500	7- 8%	IC Packages, Capacitors	Alumina, Mullite, BeO-Sic, Silicon Nitride
Catalysts	100	140	3- 4	Particulate Traps	Cordierite
Military/Aerospace	35	165	20	Radomes, Armor	Zirconia, TiB_2, SiC
Wear Products	35	50	4- 5	Nozzles, Cyclones	Silicon Carbide, Alumina
Pump and Valve Components	16	30	7	Valve/Pump Trim	Silicon Carbide
Instrumentation	15	30	7	Industrial Sensors	Zirconia
Tools and Dies	32	75	10	Rotary Cutting Tools/Coatings	Sialon, Alumina, Silicon Nitride
Process Equipment	15	75	15-20	Filtration Media	Alumina Silicate, Alumina
Dental/Medical	5	25	15-20	Dental Restorations	Alumina
Sub-Total	$1,638	$3,090	7- 8%		

Base Data: Technomic Consultants

High Performance Ceramics to Grow From $1.6 To $3.1 Billion by 1994

The age of ceramics in high performance applications is expected to grow from $1.6 billion to $3.1 in 1994, according to the Norton Company and a study conducted by Technomic Consultants, Inc.

In a recent press conference held by Norton at its High Performance Ceramics headquarters in Northboro, Mass., company executives pointed to new and existing opportunities for growth in the industry.

Richard A. Alliegro, vice president for the company's High Performance Ceramics Division noted, that studies show that electronics is the dominant segment of the market representing more than 80 percent now and about 80 percent in 1994. Military and aerospace applications amount to about $35 million currently and could grow 20 percent a year over the decade.

Said Mr. Alliegro, "In addition to the existing opportunities, new ones will evolve between 1989 and 1994 including ceramics for heat engines."

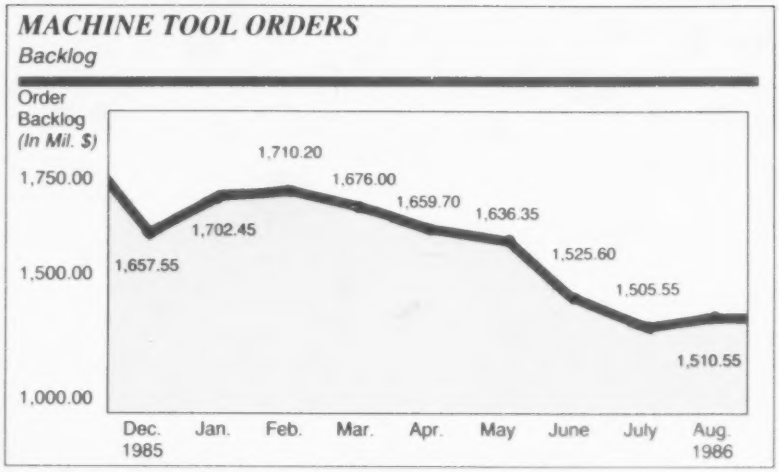
He estimated "These users of ceramics could begin to commercialize in 1990 growing to $75 to $100 million with a real possibility of $500 million."

Total market figures could surpass $5 billion perhaps pushing $10-$12 billion by the end of the decade, he said.

"Newer applications such as heat sinks for electronic packages, heat exchange tubes for high temperature furnaces are extending their utility however in the structural area we've barely scratched the surface," he said.

"Take for example, silicon nitride cutting tools as a replacement for tungsten carbide in machining cast iron. In one particular test involving silicon nitride tools mounted on a high speed spindle operating at 8000 rpm driven by a 200 horsepower motor, an engine cylinder was bored out in one second, four cylinders in four seconds. The normal rate for this operation for four cylinders with carbide was 44 seconds. This is a tremendous reduction in time, indicating a real revolution in productivity brought about by advanced ceramics," he noted.

"Ceramic bearings will likewise revolutionize many traditional applications where steel bearings are currently used. Miniature precision ball bearings made of ceramics are already finding application in environments where lubrication is a problem, for instance, space instrumentation, and certain products like CAT scanners where motors must operate in a vacuum. Main shaft bearings for gas turbines is a natural, the challenge here is one of reliable, predictable, and performance that can only be brought about by extraordinary care in manufacture. Non-destructive evaluation, NDE, must also be emphasized to ensure product quality," he said.



Machine Tool Orders Off $9.3 Million in August

Machine tool orders continued to decline in August from their July total of $170 million, according to the National Machine Tool Builder's Association.

New orders for August fell to $154.25 million, a drop of $9.3 million from the month earlier total.

Orders for metal cutting machinery fell to $114.75 million, a drop of 10.9 percent from the $120.80 million posted in July. Metal forming equipment orders fell from $41.20 million in July to $39.50 million in August, a 4.1 percent drop.

Comparing August 1986 with August 1985, metal cutting machine tool orders fell by 12.3 percent while orders for metal forming equipment fell by 26.4 percent, resulting in a combined drop of 16.4 percent. Year-to-date orders for metal cutting machine tools were down 11.1 percent compared to the same period in 1985, while orders for metal forming equipment dropped 15 percent. Combined orders through August 1986 totalled $1,540.60 million, a drop of 12.2 percent from the $1,754.00 million for the same period in 1985.

August shipments of metal cutting machine tools fell to $108.30 million from $149.10 million in July, a drop of 27.4 percent for the month. This figure represents a fall of 24.3 percent compared to shipments in August of last year. Metal forming shipments remain unchanged for the month, holding at $40.95 million. This represents 43.8 percent drop when compared to August of 1985. Total shipments fell 21.5 percent for the month dropping to $149.25 million. Compared to August of 1985 shipments were down 30.9 percent.

Machine tool order backlogs for August stood at $1,510.55 million up from the $1,505.55 million in July.

Okuma Ups Prices 15 Percent

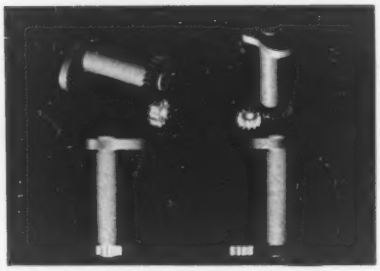
As evidence of the general decline in sales of Japanese machine tools worldwide, Okuma Machinery, Inc. has increased its prices on all of its products with the exception of its newest introductions.

The company's CNC lathes, machining centers and cylindrical grinders will be increased 15 percent according to Tadeo Okuma, the company's chairman and John D. Hendrick, senior vice president of the company.

The increase is the second price hike since March 31st of this year and according to Mr. Okuma and Mr. Hendrick it was prompted by "the change in the value of the dollar versus the yen."

Both Mr. Okuma and Mr. Hendrick noted "The yen has substantially increased the cost to provide Okuma products and services in the U.S. Now a price increase is not only warranted, it's needed."

The Shake-Out that Shook-



New companies, emerging with an unprecedented vigor since 1984, have been noted for introduction of radical implementation of technology.

IN THE REALM OF COMPUTER INTEgrated manufacturing (CIM), the CAD/CAM industry's most alluring buzzwords are graphics and solid modeling. Now that industry has effectively resolved the problem of cost to computational capacity, graphic engineering workstations with sophisticated applications software such as solid modeling, and shop floor devices—also equipped with graphic capability—are being strategically implemented to revolutionize manufacturing.

The dramatic shake-out experienced by the CAD/CAM industry during the 1983 time frame has forced surviving companies to develop new and improved versions of computer hardware and software. In addition, new companies, emerging with an unprecedented vigor since 1984, have been noted for introduction of radical implementations of the technology.

For example, a typical microcomputer today offers more than 20-times the processing power, 20-times the main memory and 500-times the disk storage—at less cost—as microcomputers of the late 1970's.

Further, new software capabilities—including solid modeling, Finite Element Analysis (FEA), mechanisms analysis, more efficient operating systems (O/S) and networking—coupled with steadily improving price/performance ratios have contributed to the increased availability and use of computer-based tools in the manufacturing environment.

In short, competition is keen. As a result, however, never before has the industry offered so expansive a field of functional, cost-effective and easy-to-use tools capable of full integration from conceptual design through production.

According to a survey of CAD/CAM-CAE systems and vendors published by Daratech, Inc., Cambridge, Mass., worldwide usage of CAD/CAM-CAE—driven principally by personal computer-based units costing as little as $5000—is growing by an astounding 10,000 units per month.

Where is this equipment going? Largely to the shop floor.

Implementation of graphics on the shop floor has almost unlimited possibilities—as part of a machine tool control showing what is going on or previewing the next job, as an adjunct to programmable or process controllers showing the status of work cells or a whole line, as a read-only operator assist for drawings or process plans, or as a real-time assembly line aid to provide assembly instructions and drawings without any paperwork.

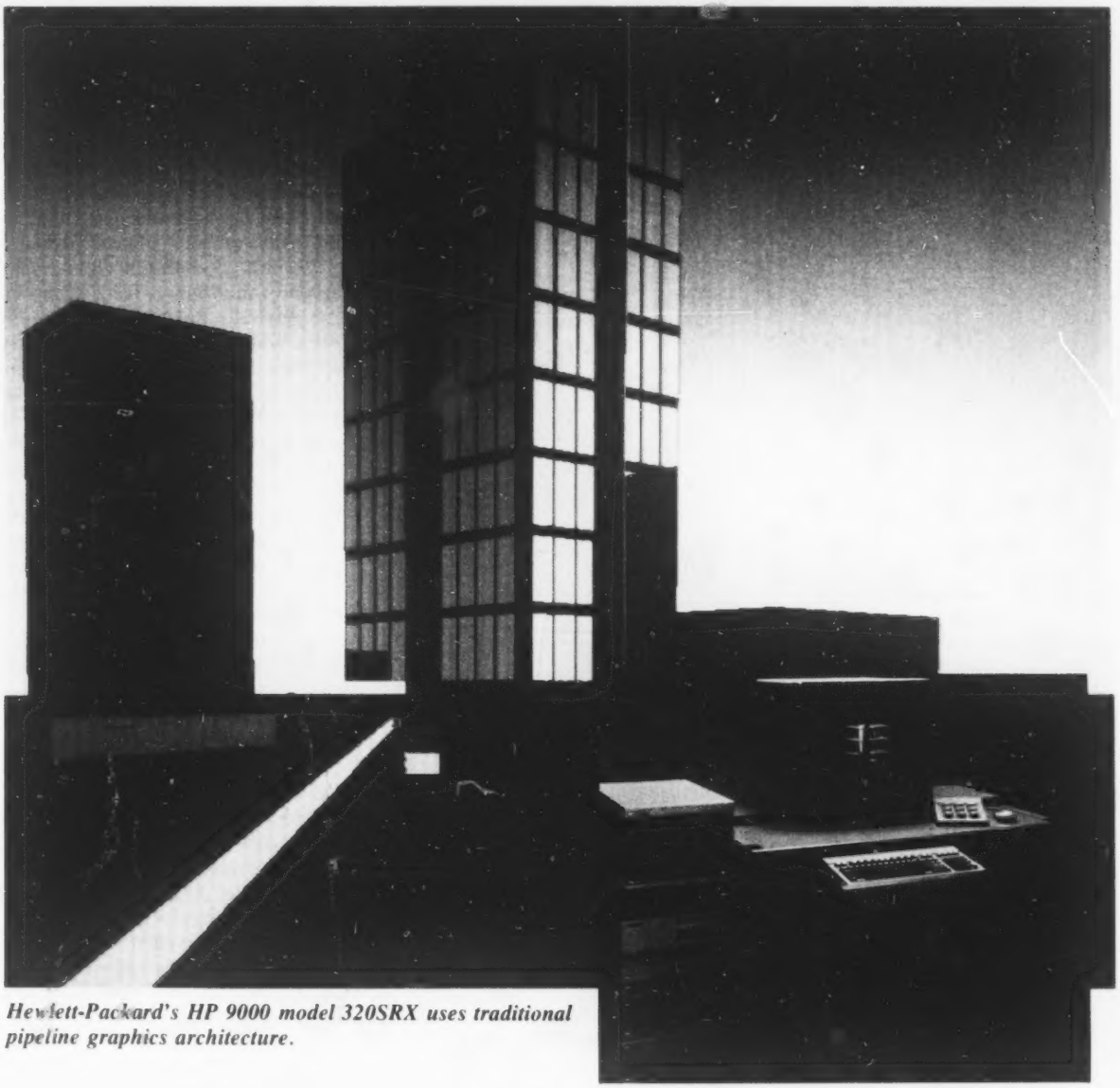
A study conducted by the Yankee Group, Boston, Mass., concluded that graphics on the shop floor have the potential to change the rules in manufacturing by allowing the operator to control the manufacturing process. With shop floor graphics, automation can be a support for line workers who require information on processes and equipment quickly, in an easily understood format and completely enough to provide a basis for decision and action.

In the factory environment, shop floor graphics is in its infancy compared to its wider use in the engineering/design world. However, in the next five years it is forecast that the growth rate for shop floor graphics will be faster than that of engineering/design graphics. The narrowly defined factory floor graphics market is estimated to be $188 million in 1985 and is expected to grow at 30-35 percent per year for the next few years.

Considering that estimates for the growth of factory automation, although varied, reach $90 billion by 1990, it can be safely assumed that the computer graphics segment of the CIM market will have a dramatic impact on the future of manufacturing. Although it is generally conceded that total lights-out manufacturing will not be a common occurrence for at least five more years, it is evident that more and more companies will be quickly approaching that goal.

By Sandra Lee Brooks
Mid-West Editor

Up the CAD/CAM Industry



Hewlett-Packard's HP 9000 model 320SRX uses traditional pipeline graphics architecture.

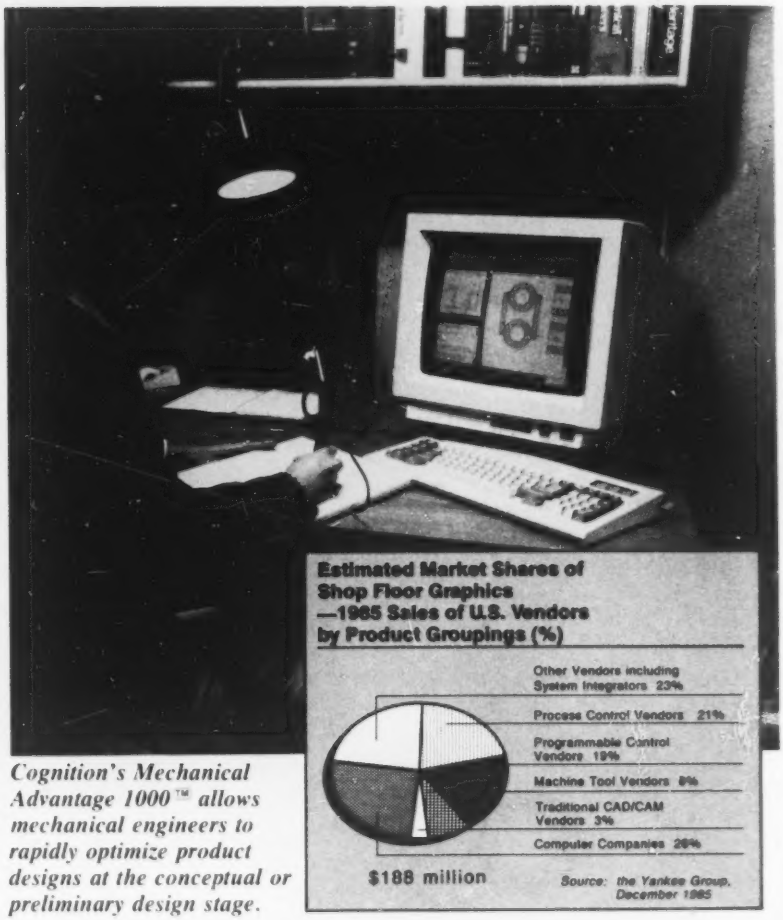
How, then, can computer-based graphic tools—broadly defined as CAD/CAM—best be utilized to take full advantage of CIM concepts to achieve a competitive edge in manufacturing?

Concept Engineering

The success or failure of a product is often determined by the quality and timeliness of engineering decisions made at the conceptual design stage of product development. It is *the* most important phase in determining ultimate product cost, performance and reliability.

Therefore, engineers responsible for conceptual design are under tremendous pressure to quickly optimize a design while observing a multitude of constraints. In an effort to minimize lead-times, tooling, materials and production costs, however, the integrity of the overall product concept may be compromised.

Up to this point, few computerized tools have been available for use in


Estimated Market Shares of
Shop Floor Graphics
—1985 Sales of U.S. Vendors
by Product Groupings (%)
Other Vendors including System Integrators 23%
Process Control Vendors 21%
Programmable Control Vendors 19%
Machine Tool Vendors 8%
Traditional CAD/CAM Vendors 3%
Computer Companies 26%
$188 million
Source: the Yankee Group, December 1985

Cognition's Mechanical Advantage 1000™ allows mechanical engineers to rapidly optimize product designs at the conceptual or preliminary design stage.

conceptual design, most being limited by very specific solutions, non-integrated architecture, difficulty of use and excessive cost.

A new company, sprung from the debris of the early 1980's shake-out, has brought to market a software product which incorporates advanced computer-assisted technologies and artificial intelligence techniques to allow for the optimization of conceptual product designs easily and rapidly.

Founded in February 1985 by Philippe Villers (Villers founded Computervision in 1969), Cognition Inc., Billerica, Mass., has created the first fully integrated mechanical computer-aided engineering (MCAE) system. Known as Mechanical Advantage 1000 (MA 1000), the system deals with the conceptual or preliminary design stages during which engineers develop, examine, analyze and refine product design alternatives.

MA 1000 generates an integrated engineering model that stores both the geometry of a design concept and the underlying engineering principles. An intelligent electronic notebook stores the history and engineering intent of a design. Resident expert systems extend the engineer's skills allowing a user to easily explore design and manufacturing alternatives. An optimal design can then be passed to a CAD/CAM system, via IGES (Initial Graphics Exchange Specification) and specialized translators, for the creation of detailed engineering drawings. The integrated engineering model, containing both geometry and analytical information, can then be used to test a design concept before building a prototype.

Each MA 1000 system includes a Cognition Application Engine Plus (CAE+), based on Digital Equipment Corp.'s MicroVAX II, connected by an ethernet local area network (LAN) to up to five personal workstations. Based on augmented IBM PC/ATs with high-resolution color monitors, the CAE+ uses ULTRIX-32M, DEC's UNIX operating system; personal workstations are CGA-compatible for full use of IBM graphics programs. These use the MS-DOS operating system, allowing access to other software packages.

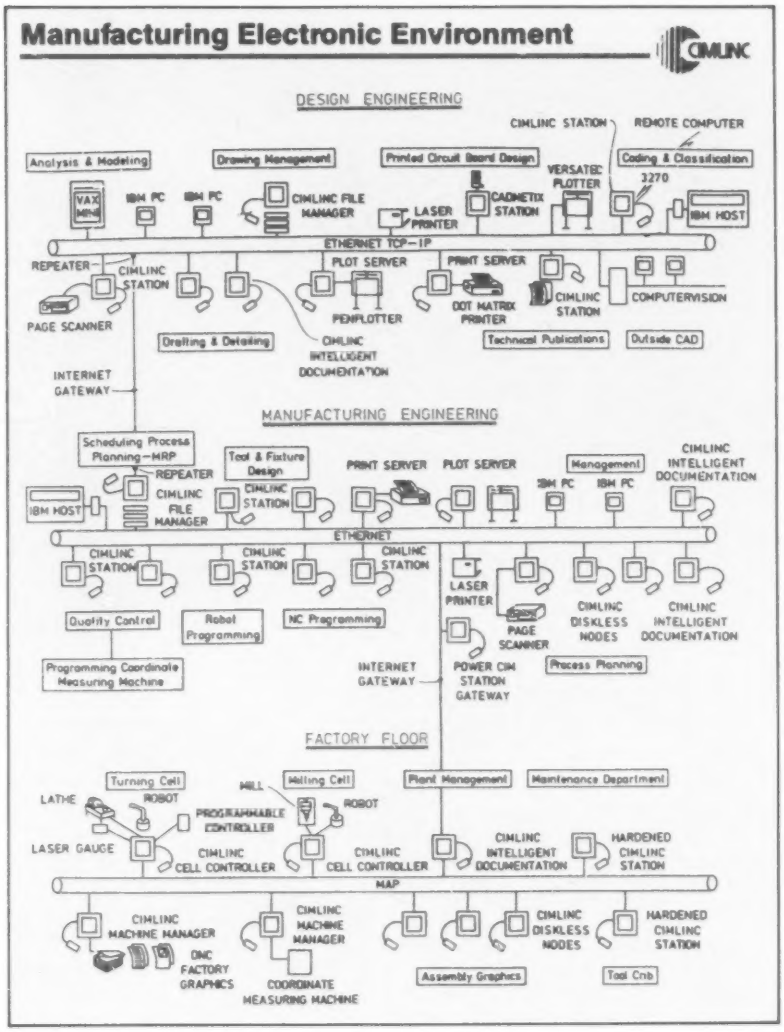
Looming on the horizon is yet another start-up, Aries Technology Inc., Lowell, Mass., also positioned to serve the needs of the conceptual design engineer. Founded in 1984 by Gerald Christopher (formerly DAVOX Corp.), Richard Miller (formerly Applicon, Inc.), Dr. Jack Horgan (formerly Applicon), Arthur McCray (formerly CAD/CAM Consulting Group), and Jerry Sabath (formerly Applicon), Aries Technology plans to unveil its first products during the AUTOFACT Exposition & Conference, November 11-14, Detroit, Mich.

By automating concept engineering, design geometry will be more easily created, verified and modified prior to sending it on to drafting. This, in itself, will increase the quantity and enrich the quality of design alternatives engineers can consider within time and budget constraints. In fact, concept engineering systems can be expected to shorten the total concept-through-manufacture cycle by up to 30 percent, according to Aries Technology.

Further, the number of prototypes necessary for verification will be significantly reduced, or even eliminated. It is conceivable that a data base initiated in design will eventually be used to directly program manufacturing processes.

CAD/CAM

Time was that computer-aided design was simply 2-D tube-generated 'pictures', computer-aided manufacturing an NC tape-prep methodology and advanced software techniques such as solid modeling, finite element analysis and 3-D anything resident only in experimental laboratories in a handful of



Cimlinc has focused its hardware and software development to integrate islands of automation throughout the factory environment.

the world's leading universities and R&D institutions.

As recently as 1980-82, the industry was still seeking solutions to "closing the gap" between CAD and CAM, pursuing a reliable method of transferring data between computer files. Since then, the development of standards and the astounding sophistication of computer hardware and software systems has literally melded that which "never the twin shall meet" into a massive conglomeration of applications software, often built upon successive "CAD/CAM" sessions with data being easily transferred from file to file until, finally, the data is downloaded to a cell controller which initiates a manufacturing operation.

Vendors once defined as CAD or CAM now offer expansive libraries of applications software and improved hardware and software interface capabilities which encourage the use of competitor's or third-party programs. As a result, users can easily build a 'custom' CAD/CAM system selecting those hardware and software products which provide only those capabilities necessary to maximize operations unique to an organization from, virtually, off-the-shelf products. The 'whiz-bang' days of the infant computer industry have been supplanted by modular functionality.

For example, Autodesk, Inc., Sausalito, Calif., produces a computer-aided drafting and design program known as AutoCAD. The micro-based CAD software allows 2-D drafting and 3-D visualization enhanced by such features as a variety of editing commands, pan and zoom operations, a general UNDO capability, support for Lotus/Intel expanded memory or IBM PC/AT extended memory which yields increased processing speed, color and line type differentiated by individual entities rather than complete layers, a time accounting facility, enhanced construction facilities including line tangent to two circles, dual-standard dimensioning in feet/inches and metric units and commands for creating ellipses, doughnuts and polygons.

An interactive programming language built into the software, AutoLISP, allows direct access to the drawing entity data base making it easier to customize AutoCAD for specific applications.

The software supports IGES 3.0, allowing two-way exchange of drawings between AutoCAD and other CAD systems supporting IGES. In addition, conformance to the IGES standard and the power of AutoLISP resident in the AutoCAD software has encouraged independent developers to produce a wealth of specialist add-on programs for AutoCAD.

AutoCAD has been designed for use with 16-bit PCDOS/MSDOS computers and the high-performance 32-bit workstation environment of the UNIX-based IBM RTPC, Sun 2 or Sun 3. The retail price for all these versions is the same, $2750.

(No wonder that Autodesk enjoys recognition as the producer of the world's most widely used computer-aided drafting and design program. AutoCAD holds 44+ percent of the PC-based CAD market.)

Applicon, Ann Arbor, Mich., (a Schlumberger company), has been best known for its leadership in the compu-

Swanson Analysis Systems has developed a computer program (ANSYS) which can construct models of structures or machine components, apply operating loads and study physical responses such as stress or temperature distribution–all without having to build the object or destroy it in testing.

ter assisted NC programming field. The company holds over 60 percent of the market share.

Recently Applicon integrated its Bravo3 CAE/CAD/CAM software with its NC programming products. The result is manufacturing capabilities expanded to include a comprehensive Design and Documentation package, along with the most widely used NC programming capability in the industry, COMPACT II.

Therefore, the system may be implemented at any stage of the product cycle from conceptual design through manufacturing. The integration of Bravo3 allows users to interactively create, modify, test or process design information in 3-D, minimizing the need for prototypes.

The Bravo3 system is resident on Applicon's high-performance workstation which utilizes the Motorola 68020 microprocessor.

Cimlinc Inc., Elk Grove Village, Ill., has focused its hardware and software development to integrate islands of automation throughout the factory environment. It's CIM system, called Power CIM, includes a range of software applications and a modular workstation environment derived from the Motorola 32-bit 68020 microprocessor.

Cimlinc's CIM CAD software, a graphics-based design, drafting and detailing package passes 2-D geometry to CIM CAM (a machine tool simulation program) or 3-D wire frame models to CIM SIRF. Also available is a 3-D modeling tool and a parametric design program which allows for optimization of conceptual design.

Cimlinc provides ethernet and MAP (Manufacturing Automation Protocol) communications, as well as links to IBM's SNA 3270 networks.

Computervision, Bedford, Mass., has modifed and migrated its CAD/CAM software to the personal computer environment.

The Personal Designer system provides production capability of design, drafting and analysis functions on the IBM PC/XT or AT.

MicroCADDS Geometric Construction and detailing and MicroCADDS Surfaces, the principle software for the Personal Designer system, are based on CADDS—Computervision's well known 15-year old base software product. The system can produce 2-D and 3-D engineering models, detail drawings, library parts, even shaded drawings.

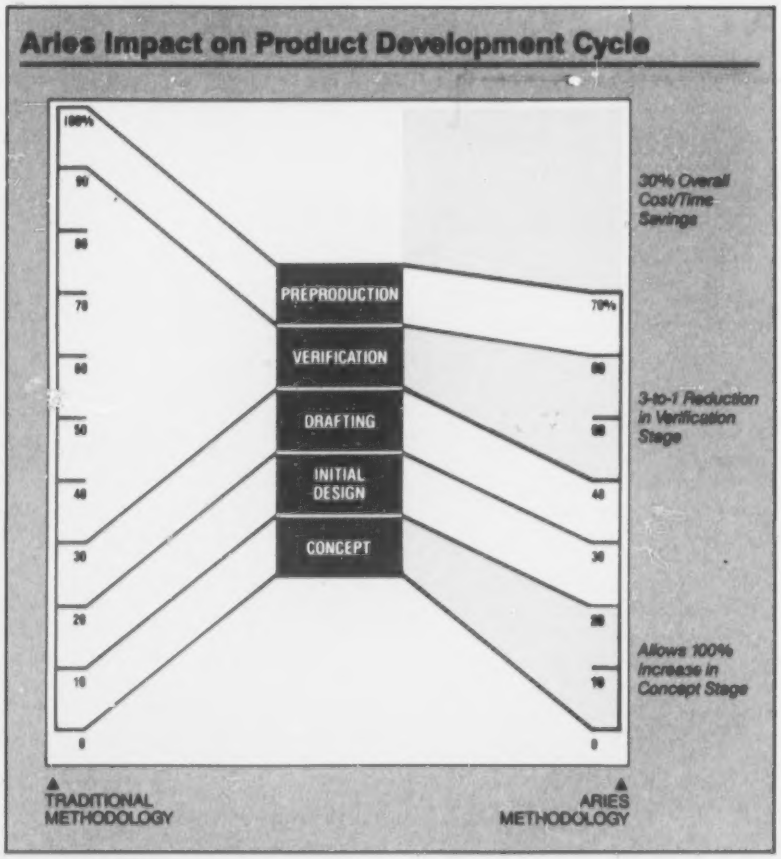
For increased functionality, the Personal Designer system can be interfaced to IBM, Digital Equipment Corp. VAX and Computervision V-X or CDS 4000 series computers. Further, the system supports selected third-party mechanical design software.

Intergraph Corporation, Huntsville, Ala., recently introduced a next generation series of graphics workstations which contain the powerful 32-bit CLIPPER processor from Fairchild Semiconductor Corporation. This microprocessor, maximized for scientific and professional computing applications in the UNIX environment, operates at a 30 nanosecond instruction cycle time yielding five times the performance of a DEC VAX-11/780.

Intergraph's offering of application software includes CAD, CAM, finite element modeling, parametric design, mechanism modeling, sculptured surface and flap pattern nesting programs. NC programming software includes packages for Design/Toolpath Integrity, Machine and Tool Libraries, Toolpath Verification, Milling, Turning, Sheet Metal Machining, and Program Sequencing and Output.

McDonnell Douglas, St. Louis, Mo., has released a series of hardware and software enhancements for its Unigraphics system For increased computational capability, the UNIGRAPHICS II software for CAE/CAD/CAM has been repackaged to reside in the DEC VAXstation II/GPX standalone workstation environment. Enhancements to the UNIGRAPHICS II software include utilities for computer-aided engineering, analysis, synthesis, optimization, simulation and documentation and new modules for Machine Elements, Assemblies and Components and Interleaf Interface.

Prime Computer Inc., Natick, Mass., has entered into a series of third-party software agreements to compliment its PRIME MEDUSA



Aries Technology plans to automate concept engineering, which will allow design geometry to be more easily created, verified and modified prior to sending it on to drafting.

software for 2-D CAD, and 3-D modeling. The CADCentre, Cambridge, England provides GNC, an interactive, graphic NC programming system; Merry Mechanization, Wyoming, Minn., provides SMP-81, a sheet-metal design program featuring unfolding routines; from Counting House Computer Systems, Edmunds, England, come the CAMNEST shape-nesting and Q-NEST sheet-metal component programs; and NCNET, a two-way NC-program distribution network is provided by RWT Corporation, Arlington Heights, Ill.

The PROMPT CAD/CAM system from Weber Systems, Inc., Brookfield, Wisc., integrated design, drafting and manufacturing with 2-D or 3-D capabilities. A patented part programming technique simplifies tasks such as spline fitting and point location. In addition to a family of parts, punching and contouring, lathe or milling routines, PROMPT PLUS also includes programming capabilities for 4-axis wire EDM. The software resides in the Hewlett-Packard desktop computer environment.

Solid Modeling

The development of a functional solid modeler has been a long and painstaking task which for many years yielded little more than the ability to create 'pretty pictures'. However, as it became evident that wire frame systems allowed only a limited degree of automated implementation, solid modelers were viewed as the only viable approach to linking CAD and CAM and maximizing the benefits of automated systems.

Early solid modelers (1979), developed at the University of Cambridge, Carnegie-Mellon and the University of Rochester were largely unreliable, non-interactive, anything but user-friendly, required extensive training and EXPENSIVE. But the increased computational capacity and memory technology of today's computer hardware coupled with 'informal' development initiated by users has yielded a practical and productive tool.

Therefore, solid modeling is fast moving out of the academic or manufacturing laborator and into engineering offices. Even with its early limited functionality, the use of solid modelers has doubled yearly since 1979 and is expected to continue to do so through 1990.

The key to solid modeling's inevitable dominance of the CAD/CAM market is the fact that it is the only known way of unambiguously representing the meaning of a design in a computer understandable form.

That means applications such as process plan generation and NC cutter path creation can be totally automated using expert systems to interpret CAD/CAM drawings.

Here's a representative selection of the state-of-the-art in solid modeling.

Swanson Analysis Systems, Inc., Houston, Pa. was founded in 1970 to develop ANSYS, a computer program used to construct models of structures or machine components, apply operating loads and study physical responses such as stress or temperature distribution—all without having to build the object or destroy it in testing.

By using a solid modeler to improve the running logistics of a design, analysis such as statics, dynamics, mode frequency, stability, heat transfer, magnetostatics, and coupled field can be conducted on a wide variety of material representations with ANSYS.

The software is available on mainframes, minicomputers and workstations and ANSYS subsets has been introduced for microcomputers.

Solid modeling R&D conducted by General Electric has been incorporated in Calma's CAD/CAM software for NC tool path verification. In contrast to 3-D wireframe verification systems, Cal-

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ma's solid modeler removes raw material by subtracting the swept volume of each tool motion. The user may then compare the machine-finished part with the original solid-based model. Any discrepancies between the two may indicate machining inaccuracies.

Control Data, Minneapolis, Minn., has developed the ICEM software package for interactive modeling of very complex parts and tasks specific to the plastics, foundry and forging.

In addition to the 2-D/3-D design and drafting program, ICEM offers finite element analysis, group technology and NC programming utilities enhanced by modules specific to electronic, hydraulic or molding applications.

Further, Hewlett-Packard has announced a 3D Modeling system for its Designcenter ME/CAD family. The ME Series 30 as it is called uses a workplane technique to create a three-dimensional model and it expands on the company's previous ME CAD systems which include the ME Series 5, Series 10, and Series 90.

The company noted that its Series 5 and Series 10 which are 2D CAD systems can be upgraded to the new ME Series 30.

The ME 30 Series adapts a 2D concept, the workplane, to locate geometry quickly for creation or modification of 3D models. Users can select any face or cross-section of the model as a workplane, using the screen and tablet menus.

Workplanes are 2D drawing areas in 3D space. A 2D profile can be created on the workplane and "machined" by commands such as MILL, BORE, STAMP or EXTRUDE, producing a 3D model in the process.

Users can designate the workplane by pointing to a face or edge of the displayed model. The workplane can be moved or rotated in a variety of ways.

This workplane design approach simplifies many 3D geometric-construction activities. It facilitates a geometry-creation process that emulates the physical machining that will later produce the real part. The effect is quicker mastery of the system by a new user, and shorter refresher time for occasional designers.

Another system, the HP 9000 Model 320SRX allows rendering of solid objects. The workstation employs a traditional pipeline-graphics architecture. Each of the four stages—display-list traversal, viewing transforms, scan conversion, and image display—is separated by dual-ported memory through which commands and data are passed.

The dual-ported memory approach allows each stage of the pipeline to operate independently, optimizing overall system throughput. This approach also allows for implementation of future enhancements to any stage of the pipeline.

Each stage of the pipeline is memory mapped into the CPU's address space via the local graphics bus (LGB). This memory mapping allows access into any stage of the pipeline in a single memory cycle and provides first-time draw of an object as fast as the redraw (See Fig. 1).

The goal for Model 320RX is high-performance throughput for applications that render shaded solid images. Each stage of the graphics pipeline is optimized for 3-D shaded polygons with hidden-surface removal.

Computer technology has become proficient in optimizing engineering and operations functions. Yet, it has not been used to its potential.

Product development and process control are vital links in the manufacturing scenario. But, the benefits realized from applying computer technology to these stages of manufacturing may yet be improved by an order of magnitude by applying emerging applications software to the factory itself.

As factories become more highly automated it becomes increasingly important to avoid mishaps—collision of robot arms, automated guided vehicle traffic jams or mobile equipment malfunction.

A subset of computer modeling, simulation, is quickly maturing. Such software is becoming easier to program and less costly. By 1990 that market is expected to reach $90 million. P

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MACHINING CENTERS

A Real World Technology That Makes Sense

...ODUCTION Roundtable:
...n Small Companies Compete?

Parts Ma... Tech...
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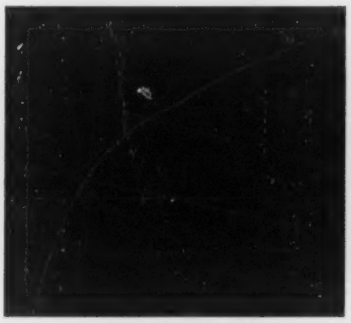
PRODUCTION

DECEMBER 1986 COVER-TO-COVER VOL. 98 NO. 6



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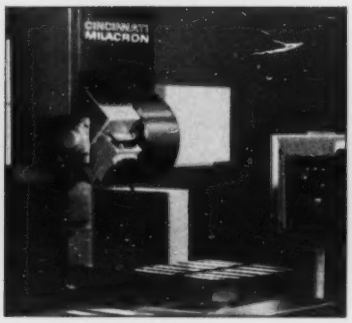

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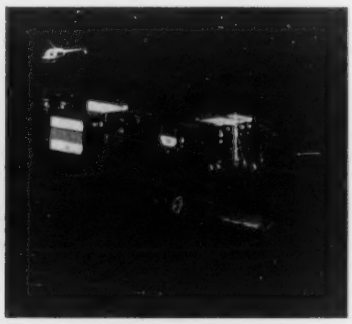

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EAST

'86 Capital Spending Plans Now Off

The U.S. Department of Commerce, late in the third quarter, turned sharply less sanguine about America's capital spending plans for 1986. In fact, in widespread downward revisions across both manufacturing and non-manufacturing industries from earlier uptick estimates, the Department now calls for a 1.9 percent decline against the 1985 figures.

Business plans to spend $379.6-billion for new plant and equipment outlays this year, compared to the $387.1-billion laid out in 1985 (9.2 percent ahead of 1984).

The downward revisions are the most dramatic in durable-goods' manufacturing, now $7.7-billion lower than that reported in April/May surveys (showing slight *gains* over the 1985 figure).

Real-spending—capital spending adjusted to remove price changes—is now estimated to drop 2.4 percent in '86. Real spending had increased 8.7 pct in 1985, following a fat increase of 15.8 pct in 1984, according to the Department's Bureau of Economic Analysis (BEA).

Estimates of real spending are calculated from survey data on current-dollar spending and from estimated capital-goods price deflators developed by the BEA. The capital-goods deflator for "all industries" is projected by BEA to increase 0.6 pct in 1986, following an 0.5 pct increase in 1985.

Current-dollar spending in the second quarter of 1986 declined 0.5 pct, to an annual rate of $375.9 billion, following a 5.0 pct dip in the first; second-quarter spending was 3.0 pct lower than anticipated in the Department's previous survey. Plans reported in the latest survey indicate a 1.3 pct increase in the third quarter and an 0.9 pct gain in the fourth.

Real spending declined 0.5 percent in the second quarter of '86, following a 5.9 percent drop in the first. Estimates now indicate a 1.5 percent gain in the third quarter and a 1.1 percent increase in the fourth.

For all of 1986, durable-goods plan a 6.9 percent decline; the largest decline is in machinery (excepting electrical), at 16.9 percent. Other larger declines are seen in motor vehicles (12.4 percent), blast furnaces and steel works (10.5 percent), stone/clay/glass (6.8 percent), and electrical machinery (6.3 percent).

Aircraft and fabricated metals anticipate gains of 11.9 percent and 11.7 percent respectively. Non-durable goods industries see a 5.5 percent decline. A large expected decline in petroleum, at 27.5 percent, and smaller ones in textiles (7.0 percent) and food beverages (0.2 percent), more than offset planned increases in other non-durable industries.

New Plant and Equipment Expenditures by Business
[Percent change from preceding year]

	ACTUAL		PLANNED 1986			
	1984	1985	Oct.-Nov. 1985 survey*	Jan.-Mar. 1986 survey*	Apr.-May 1986 survey*	July-Aug. 1986 survey[1]
ALL INDUSTRIES	16.3	9.2	2.4	2.3	0.2	–1.9
Manufacturing	19.5	10.6	–.1	–.9	–2.6	–6.2
Durable goods	24.8	10.6	–2.5	–2.9	–1.4	–6.9
Primary metals[2]	18.4	8.5	–3.3	–.1	.1	–3.4
Blast furnaces, steel works	8.9	16.5	–6.8	–2.1	–2.2	–10.5
Nonferrous metals	22.6	–11.8	–1.4	1.9	–.6	2.6
Fabricated metals	22.5	3.9	–.5	7.5	13.2	11.7
Electrical machinery	27.9	5.9	–10.2	–10.7	–4.7	–6.3
Machinery, except electrical	14.1	3.7	–3.7	–3.9	–7.9	–16.9
Transportation equipment[2]	42.8	20.3	2.4	.5	1.1	–8.5
Motor vehicles	53.7	30.6	3.7	1.8	–.3	–12.4
Aircraft	22.7	–3.3	3.0	2.8	13.9	11.9
Stone, clay, and glass	11.6	10.1	.7	–4.6	–5.0	–6.8
Other durables	22.2	19.7	2.3	–.9	5.5	5.0

* As originally published.
1. Surveyed quarterly.
2. Includes industries not shown separately.

R.E. Roseliep Is Top Gun at General Broach

Robert E. Roseliep has acquired controlling interest in General Broach & Engineering Co. (GB&E), Mt. Clemens, Michigan. He has become chairman of the board and ceo, in addition to being president, the post he has held since 1978.

The company was founded in 1943 by Karl E. Eklund to manufacture standard and special broaching tools, and later machines; it has become a recognized leader in its field.

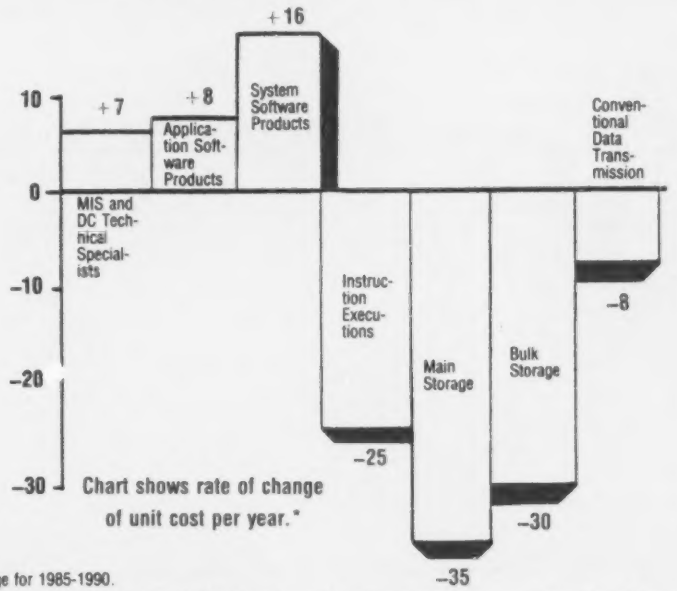
Since its founding, GB&E has formed three other affiliated companies: Eklund Broach & Manufacturing Co., to manufacture broaching tools; Select Machine Co., to remanufacture a variety of machine tools; and Mi-Cad Manufacturing, to provide production contract machining services.

Mr. Roseliep has acquired controlling interest in these firms as well. Raymond K. Eklund, grandson of the founder, owns the balance of GB&E and the affiliate company shares. He takes an active part in company management as executive vice-president.

Mr. Roseliep joined GB&E in 1953.

Robert E. Roseliep takes over at General Broach.

Summary of Key Unit Cost Trends for 1985-1990



*Average for 1985-1990.

Note: Hardware costs are based on OEM price for forecasts for components and not on enduser prices. However, OEM hardware price reductions are beginning to be passed on to end users.

Source: The Diebold Group, Inc.

Hardware Costs Down, Software Up by 1990

A 30 percent annual drop in computer hardware costs in the 1985-1990 period is forecast in a new report by The Diebold Group, Inc., an international management consulting firm. The study also pinpoints an 8 percent drop in "conventional" data communications' costs in the same period, with the "most significant impetus" provided by low-cost VLSI circuits.

Diebold's view: "The last half of this decade will see steady increases in hardware performance/price, with the 5-MIPS microprocessor and the 1-megabit RAM in volume production by early 1987."

Conversely, systems' software costs will increase 16 percent annually, and applications' software costs will grow 8 percent a year—despite improvements in very high-level languages. In contrast, personnel costs are projected by rise annually at 7 percent.

The report notes: "Systems software, including operating systems and database-management systems, is evolving at a very slow pace, with only minor advances expected in the 1985-1990 period."

The report studies product technologies that "amplify" human effort, plus process methodologies for "Information Resource Management." Trends in software-product development and acquisition, basic resource management (of operating systems, database and the like), system architecture (as well as underlying hardware-based technologies—displays, processors, VLSI circuits and so forth) are analyzed in depth to aid firms implementing technology strategies.

–Eastern region reported by Jim Dixon/Philadelphia

Assistance Offered to White-Collar and Blue-Collar Workers

Type of assistance	Establishments offering assistance to workers: White collar (N-309)	Blue collar (N-292)	Overall[1] (N-315)
Financial assistance			
Severance pay	53	34	54
Continuation of health insurance	42	32	43
Continuation of life insurance	27	21	28
Early retirement	15	10	16
Pay in lieu of notice	14	10	15
Lump sum payment	9	9	10
Supplementary unemployment benefits	8	9	10
Placement assistance			
Job search	32	21	31
Administrative support	25	16	26
Personal counseling	19	14	19
Company transfer option	21	10	21
Time off for job search	21	9	20
Career counseling	17	10	16
Relocation assistance	15	5	15
Testing/assessment of worker skills	5	3	5
Occupational training	1	3	3
Job club	2	2	2

[1]Establishments providing assistance either to white collar workers or blue collar workers or both.
SOURCE: U.S. Congress, General Accounting Office, 1986

Workers Get Short End Of the Stick

The Congressional Office of Technology Assessment has issued a report on advance notice to workers on plant closings which says in all but five states workers are given very little advance notice of imminent shutdowns.

The U.S. Congress at least since 1973 has been grappling with the issue with legislation mandating forewarning frequently being put into the Congressional hopper.

The OTA, in its report, stops short of recommending that advance notice become federal law. The five states that currently have laws that either require or encourage companies to notify workers of plant closings are Wisconsin, Michigan, Massachusetts, Maine and Maryland.

Elsewhere in the country the OTA found that workers are given very little advance notice. On average, white-collar workers receive two weeks' notice and blue-collar workers receive seven days and that shrinks to two days if there is no union.

Unions have sought laws requiring managers to post advance notice of plant closings similar to statues in Western Europe and Canada where companies warn workers between two and six months before the closing.

Proponents argue that the advance warning gives workers time to look for new jobs so that their lives aren't so disrupted and it allows time for managers, union leaders and state officials to establish services for these workers.

An earlier study of displaced workers in California found that workers from high tech industries were unemployed for longer periods than displaced workers from other industries, the OTA report noted. Part of the reason given is that workers in the non-unionized high-tech industries didn't receive advance notice of layoffs.

Data collected by the Bureau of Labor Statistics show 54 percent of California's displaced workers expected layoffs or were notified in advance by management compared with 45 percent of the state's high tech workers.

Although the Conference Board, the New York-based business organization, has said advance notification of plant closings can be good for business because it creates good will in the community for the company and improves productivity in remaining plants, businesses generally oppose any legislation requiring advance notice. The businesses' argument traditionally has been that advance notice precipitates a closing because key employees bail out immediately and customers cancel orders.

Even business owners who gave their workers advance notice told the OTA researchers they believe government requirements would be intrusive and inflexible. Small business owners were particularly concerned, saying the requirement would hurt them most.

In particular, the OTA study didn't refute management's view that notice to workers alone isn't enough. State assistance and re-training programs must be available if the advance warning is to have any purpose. This ability is lacking. The government's primary program for displaced workers—Title III of the Job Retraining Partnership Act—is still new. Furthermore, the states are responsible for implementing the program and the OTA study found the states were too undermanned to respond quickly and effectively to announcements of closings and layoffs.

In contrast, Canada's Industrial Adjustment Service is able to quickly set up committees that have been quite effective in finding new jobs for laid-off workers. As a result, the Canadian law requiring advance notification of closings hasn't been onerous for American subsidiaries operating there.

Though U.S. employers do offer some kinds of help for displaced workers, such programs are fragmentary, too brief and skewed to the white-collar force, the OTA study said.

SMT and Sajo Form Umbrella Group Firm

Two of Sweden's major machine tool companies are to merge...under the aegis of Machine Tool Invest, an umbrella company formed by the Swedish government and a number of leading Swedish institutions. The way the move will affect the two companies' varies in different countries.

In the UK, for instance, both companies will continue to operate independently. In the United States, however, Sajo and SMT will combine their sales and marketing operations.

The strategy behind the move is to create a single-source capability to penetrate markets on a broader front. This has occurred in other countries with fragmented machine tool industries. France is a good example and the Italian machine tool group, Comau, was created in this way under Fiat's guidance several years ago. Comau is now a world force in industrial automation—particularly in the auto industry—and is firmly established in the U.S. GM is an investor in the U.S. company.

Other Swedish machine tool companies will join the consortium.

–Europe reported
by Peter Mullins/Great Britain

Thailand: Number of New Factories Registered

Year	Bangkok	Other Provinces	Total
1979	14,337	53,403	67,740
1980	15,982	58,243	74,225
1981	17,470	62,720	80,190
1982	19,269	66,748	86,017
1983	19,981	71,233	91,214

Source: Ministry of Industry

FAR EAST

Thailand Targets Metal Industry For Growth

Thailand's burgeoning metals industry, which includes automobile assembly and parts manufacturing, as well as aluminum and steel fabrication, is targeted for a major increase in the newly developed economic target plan, which runs from 1986 through 1991, according to government and industrial officials.

The move, which is designed to place Thailand in a better competitive position with neighboring Asian countries like Singapore, Taiwan and South Korea, will result in manufacturing assuming a more dominant position in the country's overall economy.

Agriculture has remained the backbone of Thailand's economy, comprising approximately 24 percent of the gross national product and accounting for 60 percent of exports.

But manufacturing is targeted to grow dramatically in importance, with its share of GNP surpassing agriculture by 1990. Manufactured products presently account for 35 percent of exports.

The metalworking industry "is set up as the leading industry for the five-year plan," said Damri Sukhotanang, an official with Thailand's Engineering Industry Development Institute.

The institute, which is funded by the government, provides technical assistance to small and medium-size metalworking industries in the country. This help includes providing engineering aid and technical training to developing companies and working with Thailand's Bureau of Investment to provide tax incentives to the private sector.

The machine tool industry is one of those Thailand has singled out as a special area of attention.

The country already has the beginnings of a metalworking infrastructure. Presently, there are two manufacturers that produce machine tools, several quality casting operations and approximately 16 automobile assembly and parts facilities, including Siam Motors Ltd. (which assembles Nissan and Datsun vehicles) and Toyota Motor Thailand Ltd. (a Thai-Japanese joint venture that assembles 1,300 automobiles and trucks annually at two plants).

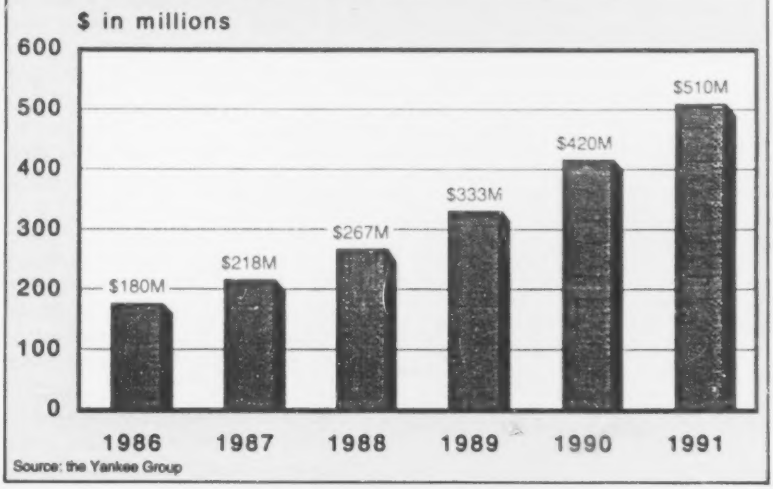
Mr. Damri said the Institute would like to see as many as 10 to 15 different companies build machine tools by 1990 as a means of bolstering the industrial infrastructure.

Nevertheless, the country faces development problems that have to be overcome such as shortage of capital and trained professionals like engineers. Thailand's geographic location also is viewed as a deteriment by some, since it is not as easily accessible.

But Thailand's literacy rate is high, there is political stability and a thriving capitalist economy and labor rates are extremely low.

A PRODUCTION
MAGAZINE staff report

The U.S. Market for DBMS Software at Large and Mid-Size Manufacturing Sites
(Exclusive of microcomputer-based systems)



Source: the Yankee Group

DBMS Has "Major Role" in CIM

"Database management systems (DBMS) and operating systems will be as important as networking in building computer-integrated manufacturing (CIM) systems," according to a new study by the Yankee Group, the Boston-based market research firm.

"Leading-edge users are looking beyond standard networks for consistency in *other* system-level software as a way to build custom systems—or their equivalent—without drowning in software-development expense," the report continues.

According to the report, "Manufacturing Database Management Systems," near-term DBMS buying "remains conservative...while users are innovating, they are doing so on a strictly experimental basis. They will not put the resulting systems into widespread use until proven.

"While each experimental, or 'test-bed' buyer is a relatively high roller, the 'bread and butter' of today's market for DBMS in manufacturing is the mainstream buyer. As shown in Figure 1, the Yankee Group believes that the U.S. market for DBMS software at manufacturing sites with more than 100 employees will grow from $180-million in 1986 to $510-million in 1991."

Advanced EDP System for Ford Stamping Plant

Installation of a $2.4-million advanced production-manufacturing information system for Ford's Woodhaven (Michigan) stamping plant is nearing completion. The contractor is American Cimflex Corporation's Logitek Division.

"This production-manufacturing information system will employ advanced Computer Integrated Manufacturing (CIM) concepts and will use cell controllers, intelligent workstation terminals and a sophisticated data-collection strategy that meets long-term CIM requirements of the factory," noted Dave Burror, president and general manager of the Logitek Division.

The turnkey system uses a broadband communications hookup that networks 251 workstation terminals (WST) that are located throughout the plant.

Plant personnel interact with the system using one or all of the following:

- 31 IBM PCs throughout the plant and running on a local area network.
- 24 four-inch 32-character marquees manufactured by American Cimflex.
- 200 pocket pagers that call appropriate workers and display the station requesting help.

The system will be on line by the first quarter of 1987.

Thermo-Mechanical Finishing Process Developed

"A new manufacturing technology process can save money and produce durable machine parts more quickly for manufacturing industries," said Dr. Maurice F. Amateau, a Pennsylvania State University researcher, University Park, Pa.

This new technology is said to cut a number of steps needed to finish such precision machine parts as cams, bearings, gears and rollers that are used in such industries as automotive, machine, tool and aircraft.

The "Thermo-mechanical finishing process can be directly substituted for many conventional finishing operations that involve metal removal, thus saving considerable cost while maximizing mechanical performance," said Dr. Amateau, professor of engineering science and head of the Department of Engineering Materials at the Applied Research Laboratory at Penn State.

One specific application of this new technology has been used in the finishing of precision gears, and it has been patented by International Harvester's Dr. Amateau.

–Eastern region reported by Jim Dixon/Philadelphia

What It Takes To Be Successful In the Export Market

The potential is there; manufactured goods constitute 76 percent of total U.S. merchandise exports.

By Sandra Lee Brooks
Midwest Editor

"One in six of our manufacturing jobs and one in four of our farm acres produce merchandise for overseas markets. Roughly speaking, every billion dollars worth of American manufactured goods exported means more than 25,000 American jobs. And overall, today nearly 5.5 million American jobs are connected to exports."

–Remarks made by President Reagan during ceremonies opening "World Trade Week", May 19, 1986.

AS MARKETING STRATEGISTS DEVELOP corporate plans for increasing market share in the shrinking domestic marketplace, many companies are developing concurrent plans to expand the market size by pursuing foreign sales.

The potential is there; manufactured goods constitute 76 percent of total U.S. merchandise exports. However, exporting is no easy task; of the total manufactured goods exported, 11 percent is brought to foreign markets by only five exporters. Overall, the U.S. Department of Commerce estimates that only 30,000 of the 300,000 U.S. firms export and an additional 18,000 U.S. firms could export but do not.

The scope of the trade deficit reflects the magnitude of the export challenge. Although the U.S. remains the world's leading exporter trading nearly 16 percent more goods than its closest competitor, the U.S. exports far less of its total production than other trading nations.

Exports for the first six months of 1986 were 1.5 percent above last year's total which will account for an annual rate of $216 billion for this year. At the same time, however, imports rose 6.2 percent to an annual rate of $384 billion. As a result, the trade deficit stands at an annual rate of $168 billion, compared with the $148.5 billion deficit in 1985.

The grim effect is that, as of 1985, the U.S. has shifted from the status of the world's largest creditor to that of the world's largest debtor—it's debt of $107.44 billion surpasses that of Brazil and Mexico.

There are a number of factors which have contributed to the imbalance of trade; the strong dollar, limited financing and government regulations to name but a few. But, even the limited number of successful exporters indicate that such trade barriers can be profitably overcome. The key is to plan.

Export Marketing

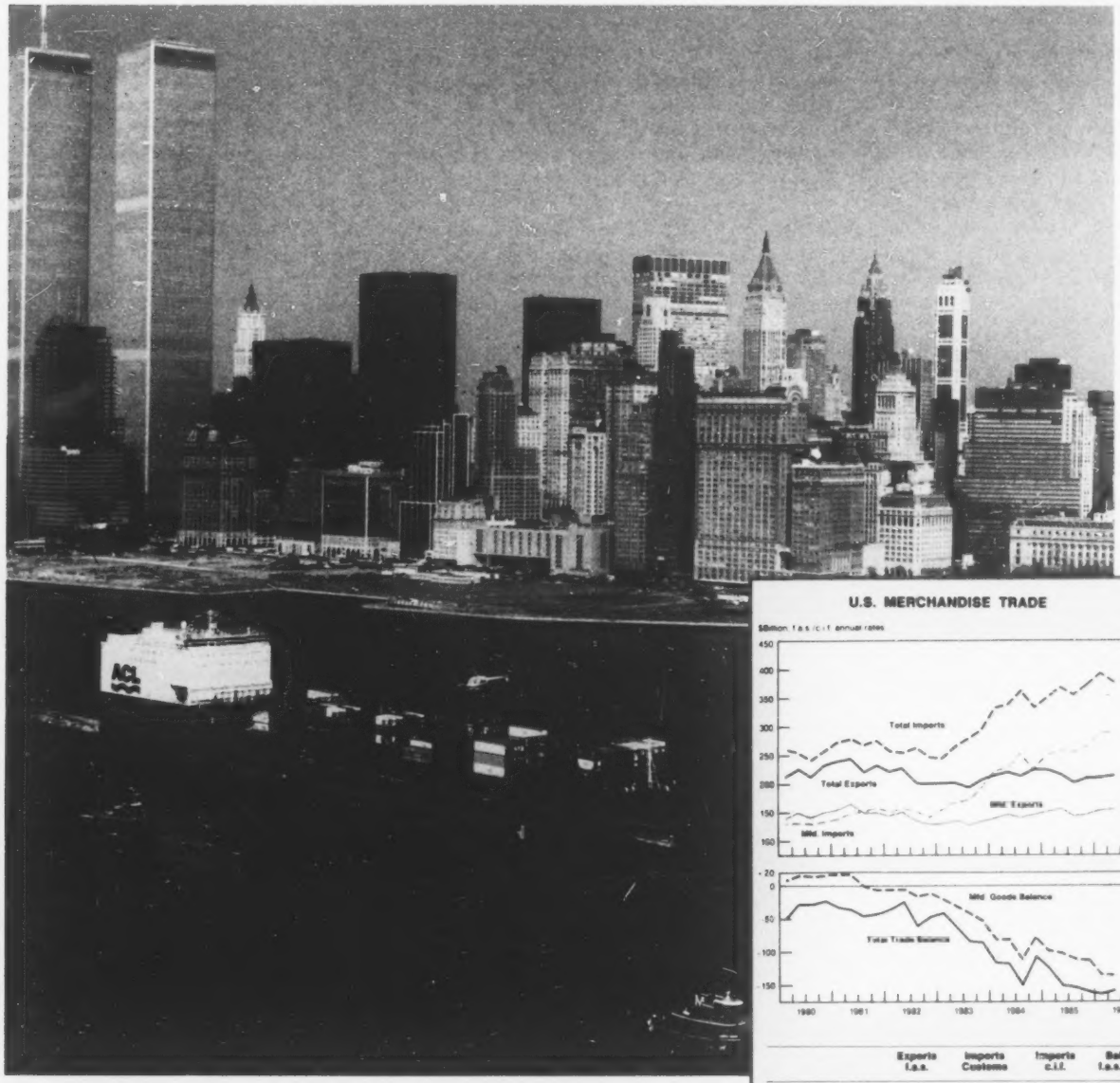
"Foreign producers and many U.S. manufacturers believe that the *real* reason U.S. companies, regardless of size, do not sell overseas is that they do not market. Either companies simply do not try to penetrate foreign markets or the potential is not thoroughly evaluated in the first place," according to Boris Krantz, president, Krantz Associates, Inc., Watchung, New Jersey.

Basic business considerations—specifications, adaptation costs, national and international competitors, target markets, potential users, available capacity, management—demand a detailed understanding in an international marketing venture.

A very simple example is measurement. Parts in the U.S. are produced to inch standards. Virtually all other countries work to metric values. What does the off-shore customer do when called upon to tighten an American-made bolt to measure a part for repair?

As Lee Morgan, retired chairman of Caterpillar and member of the President's Export Council points out, "The U.S. is not the standard of the world." Adapting domestic products to conform to foreign standards and specifications requires careful analysis of design, manufacturing, economic volume quantities and associated costs.

Identification of potential users, target markets and competitors also requires intensive survey work for each specific foreign country and geo/political business structure. One shortcoming of U.S. businesses entering the export marketplace is the failure to fully grasp the implications of the fact that Western Europe, for example,



is *not* a single, large market.

"The image of the European Economic Community (EEC) is in many ways just that...an image. Europe is really very fragmented with differing languages, laws, customs, distribution patterns and business styles," explained Mr. Krantz.

Individual countries have unique barriers vis-a-vis certain countries. Individual governments tax commodities in varying degrees. Privitization of industry, e.g., the United Kingdom and France, also effect a market's tendency for acceptance of foreign product.

A classic case in point is General Motors which for the past three years has headed *Fortune* magazine's list of 50 leading exporters. Its traditional large-wheelbase models never penetrated the affluent European market. Why? Europeans pay free-market prices for fuel and governments heavily tax energy consumption. Further, a sophisticated rail network links Western Europe with economical and punctual service minimizing the need for private transportation.

U.S. MERCHANDISE TRADE

$Billion f.a.s./c.i.f. annual rates

		Exports f.a.s.	Imports Customs	Imports c.i.f.	Balance f.a.s./c.i.f.
		(Billions of dollars, annual rates)			
Total trade					
1985 annual		213.1	345.3	361.6	– 148.5
1985	II	217.3	352.0	368.9	– 151.6
	III	201.4	338.4	354.7	– 153.4
	IV	209.3	356.7	372.8	– 163.5
1986	I	214.6	371.5	388.5	– 173.9
	II	217.9	363.2	379.7	– 161.8
Manufactures trade					
1985 annual		150.7	246.8	258.2	– 107.5
1985	II	157.4	248.3	259.9	– 102.5
	III	143.2	244.4	256.0	– 112.9
	IV	145.1	253.9	265.1	– 120.0
1986	I	153.2	272.1	283.8	– 130.6
	II	154.8	276.8	288.0	– 133.2

Exports for the first six months of 1986 were 1.5 percent above last year's total which will account for an annual rate of $216 billion for this year. At the same time, however, imports rose 6.3 percent to an annual rate of $384 billion.

The potential exporter also must assess the capacity available for foreign markets. Initially, export volume is likely to be marginal and erratic. Can production accommodate peaks in demand or is it prudent to limit export sales volume until realistic forecasts can be made?

If and when an offshore venture is successful, other strategic questions will arise:

- Is the export activity compatible with the company's long term strategy?
- Which strategy should be employed short term?
- Should capacity be increased? What about capital investments?
- Is the purchase of a new plant abroad an option?
- Is the purchase of a commercial distribution network practical?
- Is the company financially strong enough to assume the cost of doing business overseas?
- Does the company have the resources to meet increased demand for R&D, new products, varying specifications?
- Does the company have the legal expertise available to defend patent rights, protect the company on antitrust issues and set up licensing agreements?

Finally, how will the company manage its export business? Who will run the export operation? If it is successful, will control be passed to a foreign national? How will a successful international operation impact on home market and domestic sales/marketing organization?

Risk Management

All business strategies require contingency plans. However, the increased number of factors which affect international trade warrant increased attention to best-care, worst-case scenarios.

Initially, the new exporter is primarily concerned with the availability of cash to start the operation, an adequate distribution channel and the financial strength to survive a loss.

As the export operation matures, risk management strategies will expand to include an evaluation of the life of a defined market and product. This analysis hinges upon the political/social/economic climate of the foreign country(s) as well as the global market situation. If the business is stable and the external factors appear manageable it is time to develop a formal sales and marketing strategy, consider new investments (both domestic and foreign) and strengthen the organization's position in the money markets. "A business whose strength is solely the exchange

'E' Star Awards Cite Accomplishments Overseas

Accepting the "E" Award from President Reagan is Robert M. Sunnen, chairman and ceo of Sunnen Products Co. The company has exported precision industrial and automotive honing equipment for more than 30 years.

The President's "E" Award was created by Executive Order of the President in 1961 to recognize persons, firms or organizations that significantly contribute in the effort to increase U.S. exports.

The "E" Award was introduced as a revival and adaptation of the WWII "E" pennants awarded to industrial plants for superior production. Its origin goes back to 1906, when the U.S. Navy stimulated competition in the fleet by conferring "E" pennants on ships excelling in gunnery, engineering and communications.

The President's "E STAR" Award was authorized by the Secreatry of Commerce in 1969 to afford continuing recognition of noteworthy export promotion efforts by "E" Award recipients.

To qualify for an "E" Award, a manufacturer must substantially increase the volume of exports over a four-year period. In addition, exports should constitute a significant portion of total product sales and/or be mate-

rate is not a business; it is speculation in currency," according to Mr. Krantz.

Implementing the Program

No activity or funds should be committed until a *thorough* study is made of the intended market.

Organize an export management team. Determine who will direct export production, product specifications, quality control, etc.

Formulate a representation agreement. This is a critical factor for success and immensely difficult to establish due to differences in language, culture and education. Stipulate very clearly the terms of the contract: type of partnership, exporting terms and conditions, who has control of what, financial guarantees, minimum sales and/or profit levels, territorial limits, distribution terms and conditions for termination of the agreement.

Plan for the growth of the operation including the broadening of product lines offered and expansion to additional countries. Remember that certain countries demand national ownership of the major equity interest of foreign-owned businesses.

Evaluate the position of your product in the market. Does it already exist? Are there long term customers? Will the market life of the product cover the costs of start-up marketing, manufacturing, inventory, office expenses, etc.? Will the product attract significant local or international competition?

Prepare financial forecasts balancing the potential sales revenues against the cost of exporting. Cost items include production, transportation, packaging, customs and tariff laws, storage, cost of sales in the foreign market, specialized sales support, unsold product and allowance for return, cost of capital for inventory, etc., administrative operations, legal and professional services. The difference between the cost and volume/profit potential should result in a comfortable profit margin, even after distributing commissions.

rially in excess of the industry's average percentage. Further, the company should demonstrate breakthroughs in especially competitive markets, introduce a new product into U.S. export trade, or open a new market.

During World Trade Week, May 19, 1986, President Reagan conferred the "E" Award to: Automotive Parts and Accessories Association, Lanham, Md.; Ferguson Industries, Dallas, Tx.; Kustom Electronics Lenaxa, Ks.; Macbeth, Newburgh, NY; Mayer Wildman Industries, Inc., Orangeburg, SC; Panelfold, Inc., Miami, Fl.; Paper Machinery Corp., Milwaukee, Wisc.; Timberland Co., Portsmouth, NH; and XPORT, the Port Authority Trading Company of the Port of New York and New Jersey.

Recipients of the "E Star" Award were Colonial Beef Co., Philadelphia, Penn.; Dale Electronics, Inc., Columbus, Neb.; First Interstate Convention Bureau, Los Angeles, Calif.; and Sunnen Products Co., St. Louis, Mo.

Export Resources

Making the first international connection is difficult and trying at best. Business rules taken for granted in this country often do not exist in foreign markets. But, persistence, commitment and planning can pay off. Exporting companies report that an average 20 percent of total sales is generated by export sales—in high-tech markets as much as 30 to 40 percent of total sales comes from foreign markets, according to Alfred Woodworth, Jr., managing director, Cambridge International Trading Company, Boston, Mass.

An array of resources are available to the company considering export marketing—often just for the asking or a nominal fee.

One of the most comprehensive sources of foreign marketing information is the U.S. and Foreign Commercial Service (US&FCS), an organization within the International Trade Administration of the U.S. Department of Commerce. A network of 70 U.S. offices electronically linked to 124 overseas posts in 68 countries, the US&FCS functions as an extended marketing arm to more than 95 percent of the global marketplace.

This agency provides a series of market identification and assessment data such as the Export Statistics Profile, Country Trade Statistics, Market Research Reports on selected product categories, Country Market Surveys, International Marketing Information, Overseas Business Reports, Foreign Economic Trends, Export Overview, Comparison Shopping Service and Annual Worldwide Industry Reviews.

The US&FCS also can provide data on potential agents/distributors, prospective customer company profiles and forward sales leads.

Permanent U.S. Trade Centers operated by the Department of Commerce around the world provide year-round facilities for display and demonstration of U.S. products.

U.S.Department of Commerce services are provided for nominal-fees.

A recently revolved resource to the U.S. exporter is the Export Trading Company (ETC). Believing that well-developed ETC's were needed to provide a full range of trade services and achieve economies of scale in order to lower unit costs, Congress enacted the Export Trading Company Act in 1982. Through this legislation, banks are encouraged to invest in ETC's, allowing the trading company to draw upon the financial resources and expertise of the banking system.

XPORT, the first operational public exporting trading company, is operated by the Port Authority of New York and New Jersey. Chartered to directly assist the small-and medium-sized firm, its major programs are Trade Missions and the Foreign Buyers Match. Through these programs, more than $4 million in new sales has been generated for regional firms. Other Port Authority ETC's are located in Mobile, Ala.; Detroit, Mich.; Savannah, Ga.; Boston, Mass.; Wilmington, N.C.; Houston, Tex.; LaPlace, La.; New York, N.Y.; and Norfolk, Va. P